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Monoxor® III

Carbon Monoxide Analyzer

Instruction 19-9326
Operation & Maintenance

Rev. 2 – October 2003

CE

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Product name:	Monoxor III conforms to the following specifications: European Directive 89/336/EEC EN50082-1: 1997 (Electrostatic Discharge) EN50082-1: 1997 (Immunity) EN55022; Group 1, Class B (Emission)

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1.0 INTRODUCTION

The Monoxor III is a portable analyzer designed to detect and display concentrations of Carbon Monoxide (CO) gas between 0 and 2000 ppm. The analyzer is capable of testing for CO in both ambient room air, and in the flue-gas stream of fossil-fuel fired furnaces and boilers.

Ordering Information:

Part No.	Description
19-8104	Monoxor III, includes 4 'AA' batteries, probe & hose assembly with integral water-trap / filter, and a hard carrying case
19-8105	Monoxor III, includes 4 'AA' batteries, probe & hose assembly with integral water-trap / filter, hard carrying case, plus an IrDA printer with an assortment of printer accessories including an AC adapter, roll of paper, in-car charger, belt clip, and magnet

The analyzer detects and displays the presence of CO by first drawing in a gas sample from the area being tested by the analyzer's built-in motorized pump. The gas sample is next directed into a sensor chamber where the sample is analyzed for the presence of CO. If CO is detected, the CO ppm level is displayed on the analyzer's LCD.

A permanent record of the detected CO level, along with the current time and date, can be made by using the optional wireless IrDA printer.

A backlight enables the operator to read the display in dimly-lit areas. A power-saver feature causes the backlight to automatically turn OFF after 10 minutes, and causes the analyzer to shut OFF after 20 minutes of inactivity. The power saver feature, however, is disabled while the detected CO level is above 50 ppm.

When the analyzer is used to measure the CO content in flue-gas, a rigid stainless steel probe with handle is provided that allows gas samples to be taken from within the flue stack. An integral water-trap / filter prevents water and soot from being drawn into the analyzer. The probe can also be used in ambient testing to draw in gas samples from cramped and confined areas.

If the analyzer is turned OFF while a high level of CO is still present within the unit, the analyzer's pump remains running and the unit will not turn OFF until the detected CO level drops below 50 ppm.

Notes

2.0 TECHNICAL CHARACTERISTICS

CO Display Range	0–2000 ppm
Accuracy	±5% of reading or ±10 ppm, whichever is greater*
Resolution	1 ppm
Response Time	90% of final value within 40 sec.
Battery Requirement	Four disposable 'AA' Alkaline batteries
Operating Time	Up to 18 hours continuous (pump running and backlight off)
Warm Up Time	10 or 60 seconds (depending on CO channel zero setup, refer to Page 9)
Display	4 digit by 2 line, 7-segment Liquid Crystal Display
Front Panel Controls	Six push button switches (refer to Section 3.3)
Operating Temperature:	
Analyzer	32–104 °F (0–40 °C)
Probe	1000 °F (538 °C) max. at 5" insertion
Humidity	15 to 90% RH (non-condensing)
Printer Port	IrDA or HP protocol
Weight	16 oz with batteries
Size	7.5"H x 3.1"W x 2.1"D (190x79x53 mm)

* *Tighter accuracy in the lower ranges, up to ±2 ppm, may be attained if a lower range calibration gas (e.g. 100 ppm CO) is used.*

Notes

3.0 PREPARING THE ANALYZER FOR OPERATION

To prepare a new analyzer for operation, you must install four 'AA' Alkaline batteries, install the probe (if needed), and set the correct time and date as described in the following paragraphs.

For your convenience, and to ensure that the analyzer will provide reliable CO readings, the CO sensor was installed and the analyzer calibrated on 500 ppm CO at the factory.

3.1 Battery Installation

Install fresh batteries as described below. Check the analyzer for sufficient charge prior to each use. Replace the batteries if the low-battery symbol appears in the lower right corner of the LCD. To install batteries:

1. Remove battery cover from back of unit (see Figure 3-1).
2. If old batteries are installed, remove and properly dispose of the batteries.
3. Observing the polarity markings inside the battery compartment, install four 'AA' Alkaline batteries.
4. Replace battery cover.

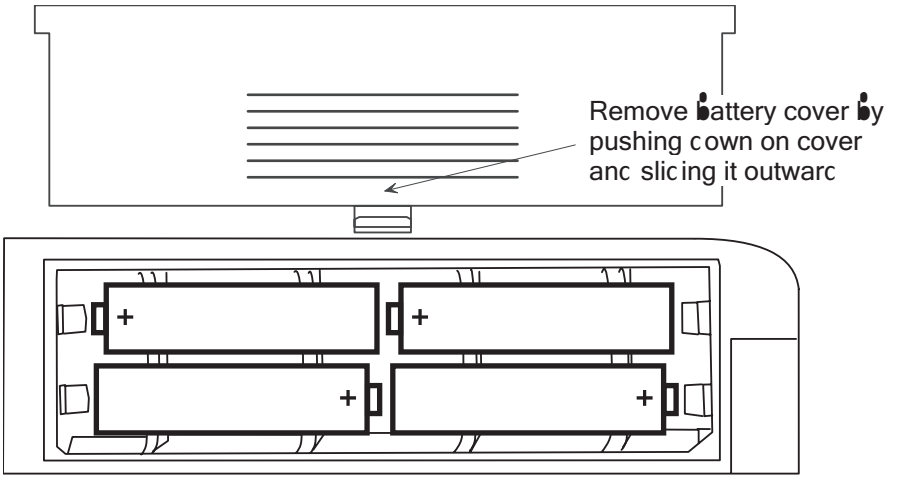


Figure 3-1. Battery Installation

3.2 Probe Installation

Install the probe if the analyzer is going to be used for flue-gas CO measurements, or if gas measurements need to be taken from a cramped or confined area.

To install the probe, simply slide its hose over the GAS inlet of the analyzer (see Figure 3-2).

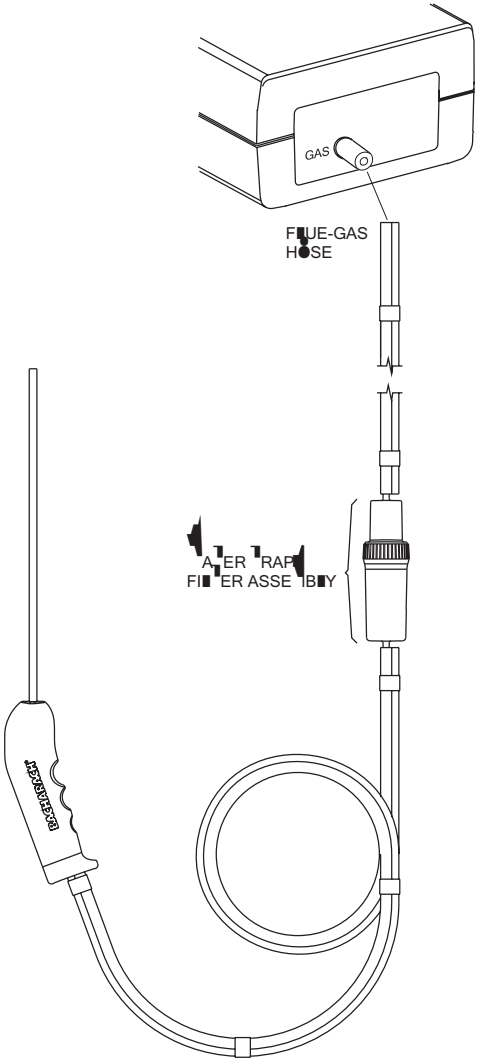


Figure 3-2. Probe Connection

3.3 Front Panel Pushbuttons

Note that a push button may perform several functions, depending on what screen is being displayed at the time.

I/O
- Turns analyzer ON/OFF. There is a 10 or 60 second warm-up and a 5 second turn-off-delay period.
- Places the analyzer into either its Setup or Calibration Mode when used in conjunction with the **ENTER** or **HOLD** button.
- Bypasses the CO purge function during turn-off.

▲
- Causes the displayed value to increase or change while in the Calibration or Setup Mode.

▼
- Causes the displayed value to decrease or change while in the Calibration or Setup Mode.

ENTER
- Starts a test – pump ON.
- Sets up the analyzer to be placed into its Calibration Mode when held down with the analyzer OFF. (Used in conjunction with the **I/O** button.)
- Stores the displayed value and automatically steps to the next screen when pressed during calibration or setup.
- Displays the CO screen when held down for 2 seconds while in the Calibration Mode.
- Aborts turn-off and keeps the analyzer turned ON when pressed during either the 5 second turn-off-delay period, or the CO purge cycle.

HOLD
- Freezes the display and stops the pump during a test.
- Starts a printout when pressed *twice* with the pump running, or when pressed *once* with the pump OFF.
- Sets up the analyzer to be placed into its Setup Mode when held down with the analyzer OFF. (Used in conjunction with the **I/O** button.)

LIGHT Toggles the backlight ON and OFF.

3.4 Setup Mode

The analyzer is preset at the factory for the parameters shown below, but can be changed as described in their associated sections.

Function	Parameter	To Change
Temperature Unit	°F	Section 3.4.2
CO Channel	Auto Zero	Section 3.4.3
Time	Not Set	Section 3.4.4
Date	Not Set	Section 3.4.5
Year	Not Set	Section 3.4.6
Printer	IrDA	Section 3.4.7

3.4.1 Entering Setup

1. With the analyzer turned OFF, press and hold down the **HOLD** button.

2. Press and release the **I/O** button.

3. Release the **HOLD** button.

4. The analyzer is now in its Setup Mode. Refer to Sections 3.4.2 thru 3.4.7 for information on how to set the analyzer's various parameters.

3.4.2 Temperature Units Setup

The Temperature Units Setup Screen is labeled "Unit".

Note: *The analyzer uses an internal temperature sensor to maintain CO sensor accuracy under varying ambient temperature conditions. This sensor's temperature reading is displayed* ***only during calibration*** *as described in Section 5.2.*

1. Enter the Setup Mode per Section 3.4.1. If necessary, repeatedly press **ENTER** until the Temperature Units Setup Screen is displayed.

2. Press the ▲ or ▼ button until the desired temperature unit (°F or °C) is displayed.

3. Press **ENTER** to move to the next Setup Screen, or **I/O** to exit setup.

3.4.3 CO Channel Zero Setup

The CO Channel Setup Screen is labeled "CO".

1. Enter the Setup Mode per Section 3.4.1. If necessary, repeatedly press **ENTER** until the CO Channel Setup Screen is displayed.

2. Press the ▲ or ▼ button until the desired parameter is displayed.

   - no **Sensor disabled.** Note that when the CO sensor is disabled the CO measurement screen will display "Err" instead of the current CO level.

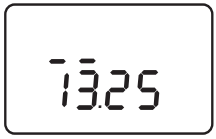
   - 2Ero **Manual Zero** – Warm-up time is 10 seconds, and the analyzer *does no*t zero the CO sensor to ambient conditions during this period. For example, if the atmosphere contains 25 ppm CO at start up, the analyzer will immediately display 25 ppm. The zero point, however, can be manually adjusted by performing Steps 1–4 of Section 5.3.

   - A2 **Auto Zero** – Warm-up time is 60 seconds, and the CO sensor is zeroed to the ambient CO level during this period. For example, if the atmosphere contains 25 ppm CO at start up, the analyzer will display 0 ppm. ***It's very important that when in this mode the analyzer be turned ON in fresh air; otherwise, incorrect CO readings will occur.***

3. Press **ENTER** to move to the next Setup Screen, or **I/O** to exit setup.

3.4.4 Time Setup

There are two Time Setup Screens, one for hours and the other for minutes. Two bars appear above the segments being changed. The clock is in a 24 hour format, but will appear as AM/PM on the printout.



1. Enter the Setup Mode per Section 3.4.1. If necessary, repeatedly press **ENTER** until the first Time Setup Screen is displayed—the one with two bars over the hour digits.

2. Press the ▲ or ▼ button until the correct hour value is displayed.

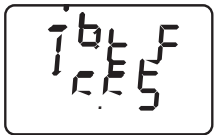
3. Press **ENTER** to move the selection bars over the minute digits.

4. Press the ▲ or ▼ button until the correct minute value is displayed.

5. Press **ENTER** to move to the next Setup Screen, or **I/O** to exit setup.

3.4.5 Date Setup

There are two Date Setup Screens, each labeled "DAtE". The first screen sets the month while the second screen sets the day.



1. Enter the Setup Mode per Section 3.4.1. If necessary, repeatedly press **ENTER** until the first Date Setup Screen is displayed.

2. Press the ▲ or ▼ button until the correct month is displayed.

3. Press **ENTER** to switch to the second Date Setup Screen.

4. Press the ▲ or ▼ key until the correct day is displayed.

5. Press **ENTER** to move to the next Setup Screen, or **I/O** to exit setup.

3.4.6 Year Setup

The Year Setup Screen is labeled “yEAr”.

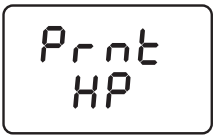
1. Enter the Setup Mode per Section 3.4.1. If necessary, repeatedly press **ENTER** until the Year Setup Screen is displayed.

2. Press the ▲ or ▼ button until the correct year is displayed.

3. Press **ENTER** to move to the next Setup Screen, or **I/O** to exit setup.

3.4.7 Selecting Printer Protocol

The Printer Setup Screen is labeled “Prnt”. The analyzer can be set up to send data to a wireless printer using either HP or IrDA protocol.



1. Enter the Setup Mode per Section 3.4.1. If necessary, repeatedly press **ENTER** until the Printer Setup Screen is displayed.

2. Press the ▲ or ▼ button to select the desired protocol.

3. Press **ENTER** to move to the next Setup Screen, or **I/O** to exit setup.

3.4.8 Exiting the Setup Screen

Press the **I/O** button at any time to exit the Setup Mode and turn the analyzer OFF. Note that the last displayed parameter is automatically saved in memory.

Notes

4.0 OPERATION

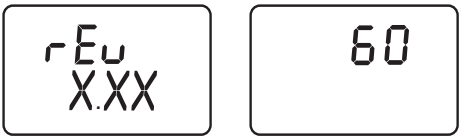
To operate the Monoxor III, you simply . . .

- Turn the analyzer ON
- Wait for the unit to warm up
- Take a gas sample

4.1 Taking a Gas Sample

> **Important!** *If the CO channel is set up for Auto Zero (refer to Section 3.4.3), ensure that the analyzer will be sampling fresh air (containing no CO) when turned ON.*

Turn ON the analyzer by pressing the **I/O** button. Observe that when power is first applied, the software revision level is first displayed followed by a screen that counts down the warm-up period. The warm-up period is either 60 seconds (Auto Zero Mode) or 10 seconds (Manual Zero Mode).



Following warm-up, the CO screen appears. This screen shows the current detected CO level in ppm. If the probe is being used, insert the probe tip into the area to be sampled.

> **Note:** *If a sensor error was detected during warm-up, the CO Sensor Error Screen will be displayed. Refer to Section 4.5.*

Front Panel Button Functions:

▲	–	No effect
▼	–	No effect
HOLD	–	Freezes display and stops pump; pressing a second time activates printing
ENTER	–	Restarts testing after the **HOLD** button was pressed
LIGHT	–	Toggles backlight ON/OFF
I/O	–	Turns analyzer OFF (with a 5 second delay)

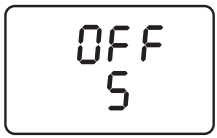
4.2 Ending a Test

WARNING! ***Burn Hazard.*** *Do not touch the probe after removing it from a flue. Allow the probe to cool before handling (about 5 minutes).*

After taking a gas sample, remove the probe and take the analyzer to an area containing fresh air. Allow the pump to run until the CO reading drops to near zero.

4.3 Turning OFF the Analyzer

Turn OFF the analyzer by pressing the **I/O** button. The analyzer will count down from 5 before turning OFF. Pressing **ENTER**, however, will abort the count down and keep the analyzer ON.

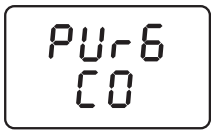


Note: *The analyzer will automatically turn itself OFF after 20 minutes of keyboard inactivity, unless the detected CO level is above 50 ppm.*

4.4 CO Purge During Turn OFF

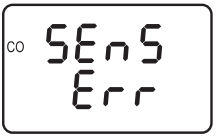
If the detected CO level is above 50 ppm when the analyzer is turned OFF, the unit will remain ON with its pump running and display "PUrG CO". The countdown from 5 will not begin until the CO level drops below 50 ppm.

Pressing **ENTER** during CO purge will return the analyzer to the CO measurement screen. Although not recommended for routine use, the CO purging process can be bypassed by pressing the **I/O** button a second time, which will immediately turn OFF the analyzer.



4.5 CO Sensor Error Screen

When the CO channel is set up for *Auto Zero* (refer to Section 3.4.3), a CO sensor error will occur if the detected Carbon Monoxide level is above 50 ppm during the warm-up period.



Note, however, that if the CO channel is set up for *manual* calibration, the analyzer does not auto-zero the CO sensor during warm-up, and thus does not generate a CO sensor error when the analyzer is turned ON in an atmosphere containing a high background level of CO.

Make the following checks before replacing a suspected spent or defective sensor:

1. Turn OFF the analyzer and turn it back ON in an area of fresh air.

2. If Step 1 doesn't eliminate the error condition, replace the sensor per Section 5.5.

4.6 Using the Backlight

The LCD can be read in dimly-lit areas by pressing the **LIGHT** button.

The backlight automatically turns OFF after 10 minutes of keyboard inactivity, but can be turned OFF at any time by again pressing the **LIGHT** button.

4.7 Using the Probe

A rigid stainless steel probe with handle, connected to a flexible hose with integral water-trap / filter can be used to draw a gas sample into the analyzer from the room, grilles, diffusers, and furnace flues.

The hose and probe assembly can be detached from the analyzer when the operator desires to sample without the probe.

4.8 Operating Tips

- When an analyzer is brought in from a cold vehicle, let it warm up slowly to minimize condensation. Temperatures below freezing will not damage the analyzer; however, bringing a cold analyzer into a warm, humid environment may cause condensate to form inside the case.
- If the CO channel is set up for Auto Zero (refer to Section 3.4.3), ensure that the analyzer is sampling fresh air when turned ON. Pulling a flue-gas sample through the analyzer during its warm-up period will not damage the analyzer, but it will result in incorrect CO readings. Also note that a CO sensor error will occur if the detected CO level is above 50 ppm during warm-up.
- Flue-gas condensate is acidic and very corrosive. It is important not to allow the analyzer's internal components to become soaked in condensate for long periods of time.
- Before each use, inspect the filter element of the water-trap / filter assembly. Replace the filter if it looks dirty.
- During a test, keep the analyzer above the water-trap, and keep the trap in a vertical position. This will maximize the effectiveness of the trap and keep liquid condensate from being drawn directly into the analyzer.
- When liquid condensate is seen inside the water trap, empty the trap before it becomes full. Refer to Section 5.4.
- It is recommended that the analyzer be purged after taking a flue-gas measurement before turning it OFF. Once the probe is removed from the stack, disconnect the hose assembly from the bottom of the analyzer and let the pump run for 10 minutes or so to completely remove any remaining flue gases, and dry any condensate from inside the sensor chamber.
- When storing the analyzer, it's a good idea to empty the water trap and leave it open to further dry it out.
- Calibrate the analyzer about every 6 months to ensure its accuracy.

4.9 Resetting the Microprocessor

If the analyzer 'locks up' and cannot be turned OFF, reset the microprocessor by removing one of the batteries for 5 seconds.

4.10 Printing Test Results

Turn ON the printer. *Refer to the printer's instruction manual for detailed operation and maintenance information.*

If not already done, set the printer parameters as follows:

- Data – 8 bits
- Baud – 9600
- Parity – None
- Handshaking – X-on/X-off

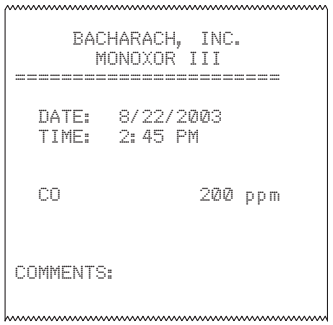
Align the printer with the top of the analyzer as shown in Figure 4-1.

Begin printing by doing one of the following:

- If the pump is running, press the **HOLD** button *twice*.

- If the display has been previously frozen, press the **HOLD** button only *once*.

  Tip: *If the printer does not operate correctly, ensure that the correct printer protocol has been selected per Section 3.4.7.*



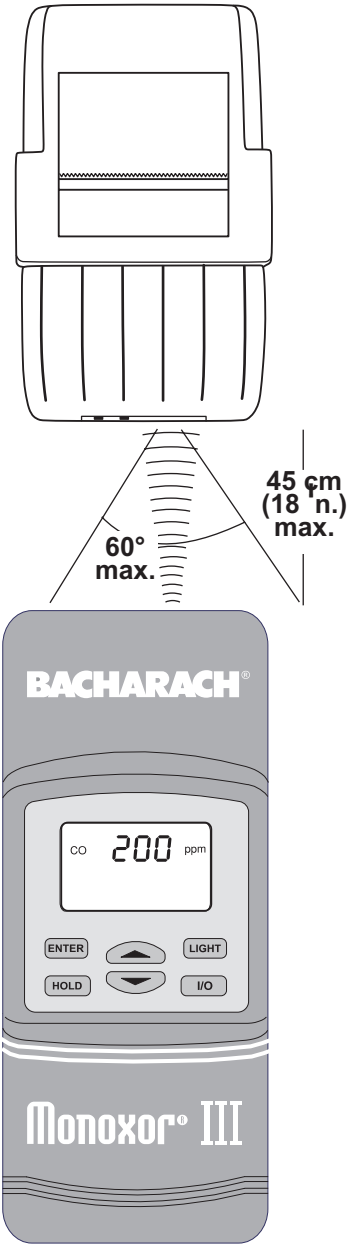


Figure 4-1. Printer Alignment & Sample Printout

Notes

5.0 CALIBRATION & MAINTENANCE

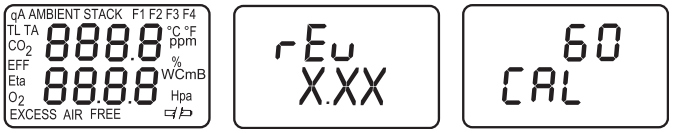
Important: *Fresh batteries should be installed, and the unit allowed to stabilize at room temperature for at least two hours before proceeding with calibration. To maintain accuracy as listed in the Technical Characteristics Section of this manual, the standards used must be at least 4 times as accurate as the stated accuracy of the Monoxor III.*

5.1 Entering the Calibration Mode and Testing the Display Segments

1. With the analyzer turned OFF, place the unit in fresh, ambient air; then press and hold down the **ENTER** button.

2. Press the **I/O** button and release it. Observe that all LCD segments are turned ON.

3. Release the **ENTER** button. Observe the unit's model number and software version are displayed. The word "CAL" is then displayed while the unit counts down from either 10 or 60 seconds. Note that the count-down time is dependent on whether the CO channel is set up for manual or automatic zero – refer to Page 9.



At the end of the count-down period, the first calibration screen is automatically displayed.

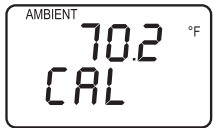
Note: *During calibration, the ▲ and ▼ buttons are used to increase or decrease a displayed calibration value.* **ENTER** *is used to store the new value and move to the next screen. Exit the Calibration Mode by holding down the* **ENTER** *button for 2 seconds.*

5.2 Ambient Temperature Calibration

Material Required: Calibrated Thermometer

Procedure:

1. Enter the Calibrate Mode as described in Section 5.1. Observe that "AMBIENT" is displayed at the top of the display; if not, repeatedly press **ENTER** until it appears.



2. Use the ▲ and ▼ buttons to adjust the displayed value to match the reading of a calibrated thermometer.

3. Press **ENTER** to store the displayed value and move to the next calibration screen, or hold down **ENTER** for 2 seconds to store the displayed value and display the CO screen, or press the **I/O** button to exit the Calibration Mode and turn OFF the analyzer without saving the changes.

5.3 CO Sensor Zero & Calibration

Material Required:
- Cylinder of 100 ppm (P/N 51-1994) or 500 ppm (P/N 24-0492) CO calibration gas
- Calibration Kit, P/N 24-7059

If you are primarily performing flue-gas testing, calibrate the Monoxor III with 500 ppm CO calibration gas. If the analyzer will be primarily used for ambient testing, then you may wish to consider 100 ppm CO calibration gas.

Procedure:

1. With the analyzer sampling fresh air, enter the Calibration Mode as described in Section 5.1. Then repeatedly press the **ENTER** button until "CO" appears in the upper left side of the display.

2. Allow the pump to run and sample fresh air for at least 1 minute.

3. Use the ▲ and ▼ buttons to set the displayed value to 0 ppm.

4. Do one of the following:
   a. End this procedure and save the new zero value by holding down the **ENTER** button for 2 seconds; after which, the CO screen is displayed.
   b. Continue with Step 5 to span the CO sensor to a known concentration of carbon monoxide.

5. Set up the Calibration Kit with 100 or 500 ppm CO as described in the instructions supplied with the kit.

6. Connect the tubing of the Calibration Kit to the inlet of the analyzer; then adjust the regulator for approximately 2 SCFH of excess flow (see Figure 5.1).

7. After the analyzer has stabilized (2 to 3 minutes), use the ▲ and ▼ buttons to set the displayed value to match the CO concentration stamped on the gas cylinder.

8. Press **ENTER** to store the new calibration values and move to the next calibration screen, or hold down **ENTER** for 2 seconds to store the new calibration values and display the CO screen, or press the **I/O** button to exit the Calibration Mode and turn OFF the analyzer without saving the changes.

9. Disconnect tubing from analyzer and turn off gas flow.

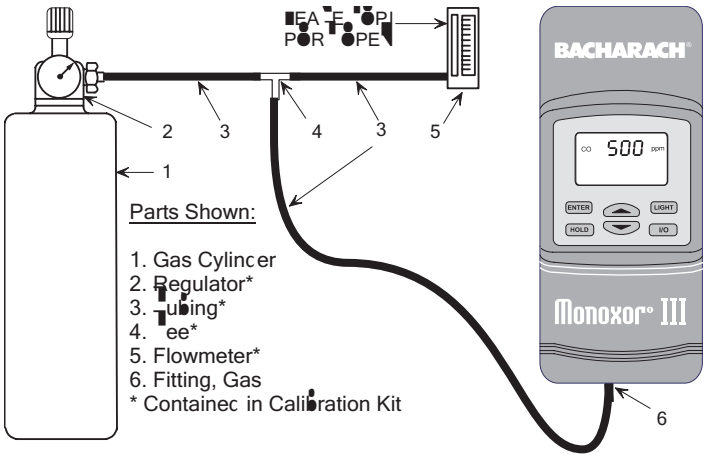


Figure 5-1. Calibration Kit Hookup

5.4 Water Trap / Filter Maintenance

The Water Trap / Filter Assembly removes water condensate from the gas sample, and also prevents soot from contaminating the internal components of the analyzer.

Drain the water condensate after every test.

Procedure:

1. Pull apart the Water Trap / Filter assembly (see Figure 5-2).
2. Pour out all water condensate; then reassemble the trap.

Replace the Filter Element when dirty.

Material Required: Filter Element, P/N 07-1644

Procedure:

1. Pull apart the Water Trap / Filter assembly (see Figure 5-2).
2. Pry apart the Filter Chamber; then remove and discard old filter.
3. Install new filter and reassemble trap, making sure that surfaces "A" and "B" are in contact.

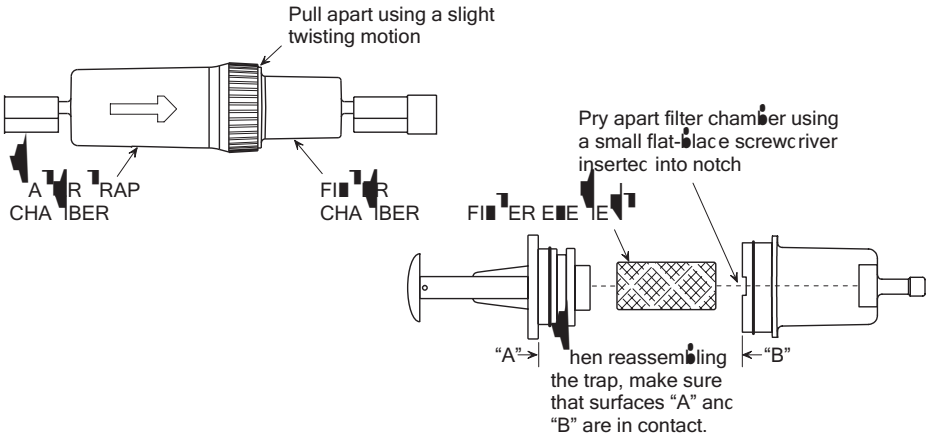

Pull apart using a slight twisting motion
Pry apart filter chamber using a small flat-blade screwdriver inserted into notch
"A"
"B"
When reassembling the trap, make sure that surfaces "A" and "B" are in contact.

Figure 5-2. Water Trap / Filter Assembly

5.5 CO Sensor Replacement

Material Required:

- CO Sensor, P/N 24-7265
- CO Sensor Gasket, P/N 24-1112
- #1 Phillips Screwdriver

Procedure:

1. Disassemble the analyzer as follows:

   a. Remove the battery cover and the batteries, uncovering one of the cover hold-down screws.

   b. Remove and set aside all four cover hold-down screws.

   c. With the analyzer on its back, remove the front cover, laying it face down to the left of the body.

   d. Carefully remove the circuit board, slipping off the battery connector on top, and then laying the circuit board face down in the top cover.

2. Gently pull CO sensor out of its socket (see Figure 5-3).

3. Properly dispose of the old CO sensor (see the instruction sheet that comes with the new sensor).

4. It is recommended that the CO sensor gasket (see Figure 5-4) be replaced at the same time as the sensor. Remove the old gasket and discard. Remove the paper backing from the new gasket and adhere it to the case in the same position as the old one.

5. Insert the new CO sensor into its socket.

6. Reassemble the analyzer.

5.6 Pump Assembly Replacement

Material Required:
- Pump, P/N 24-3020
- #1 Phillips Screwdriver

Procedure:

1. Disassemble the analyzer as follows:

   a. Remove the battery cover and the batteries, uncovering one of the cover hold-down screws.

   b. Remove and set aside all four cover hold-down screws.

   c. With the analyzer on its back, remove the front cover, laying it face down to the left of the body.

   d. Carefully remove the circuit board, slipping off the battery connector on top, and then laying the circuit board face down in the top cover.

2. Slip off the pump motor's electrical connector from the circuit board.

3. Unscrew the pump's hold down clamp and remove it from the pump (see Figure 5-4). Make note of how the pump wiring is routed.

4. Make note of how the tubing connects to the pump; then carefully remove tubing from pump.

5. Remove the old pump and discard.

6. Install the new pump and reinstall the tubing, taking care not to pinch or crimp the tubing. Also be sure that the pump wiring is routed as was noted in Step 3.

7. Reassemble the analyzer.

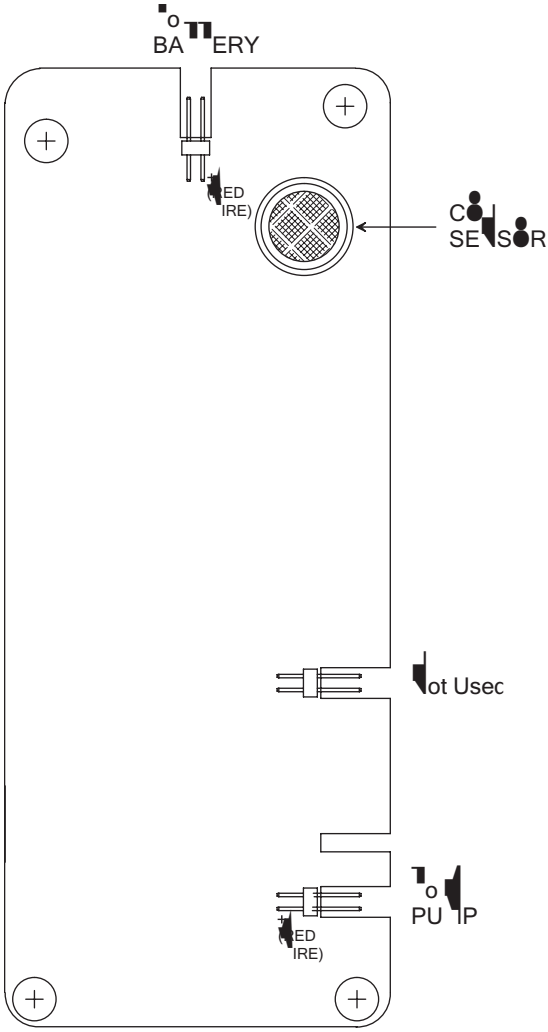


Figure 5-3. CO Sensor Located on Backside of Printed Circuit Board

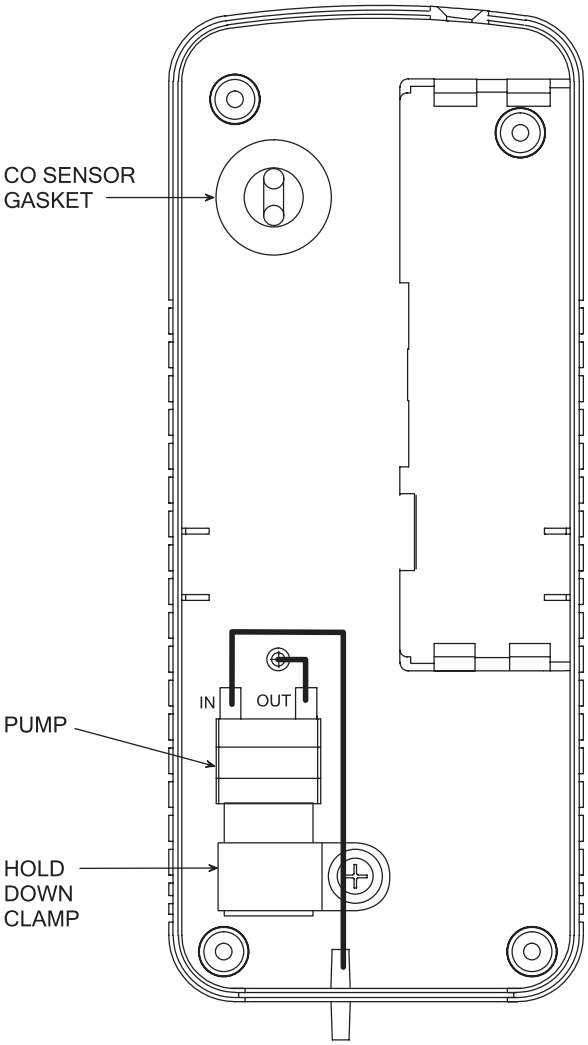


Figure 5-4. Back Case Component Locations

6.0 PARTS & SERVICE

6.1 Replacement Parts

Description	Part No.
Carbon Monoxide Sensor	24-7265
Carbon Monoxide Sensor Gasket	24-1112
Pump Assembly	24-3020
Water Trap / Filter Assembly, Complete	19-3265
Water Trap / Filter Assembly, Filter Element (pack of 3)	07-1644

6.2 Accessories

STANDARD ACCESSORIES:

Battery, 'AA' Alkaline (Qty 4)	204-0004
Instruction Manual	19-9326
Probe, Hose, and Water Trap / Filter Assembly	19-7110
Quick Start Guide	19-9327
Hard Carrying Case	24-0865

OPTIONAL ACCESSORIES:

AC Adapter (Battery Eliminator)	24-1254
Calibration Kit	24-7059
Gas Cylinder, 100 ppm CO	51-1994
Gas Cylinder, 500 ppm CO	24-0492
Soft Carrying Case	24-1267
Printer, Wireless IrDA w/120 VAC Charger (part of kit 19-8105)	24-1229
Printer Paper:	
1 Roll	06-8733
5 Roll Pack	24-1310
Protective Rubber Boot w/Magnet	24-1127
True Spot Smoke Test Set	21-7006
Filter Paper, True Spot (40 strips)	21-0019

6.3 Service Centers

Replacement parts and service can be obtained by contacting one of the following Bacharach Service Centers:

United States

Bacharach, Inc.
621 Hunt Valley Circle
New Kensington, PA 15068
Phone: 724-334-5051
Fax: 724-334-5723
Email: help@bacharach-inc.com

Canada

Bacharach of Canada, Inc.
250 Shields Court Unit #3
Markham, Ontario L3R 9W7
Canada
Phone: 905-470-8985
Fax: 905-470-8963
Email: bachcan@idirect.com

México

Bacharach de México
Playa Regatas No. 473 Tercer Piso
Col. Militar Marte
Delegación Iztacalco, 08830
México D.F.
México
Phones: +52-555-634-7740
+52-555-634-7741
Fax: +52-555-634-7738
Email: bacharachservicio@
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Website: www.bacharach-mexico.com

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Warwickshire CV31 3JR
United Kingdom
Phone: +44-1926-338111
Fax: +44-1926-338110
Email: sales@bacharach-europe.com

7.0 HAZARDS OF CARBON MONOXIDE

Carbon Monoxide (CO) poisoning results in headache, nausea, chronic tiredness, confusion, dizziness, and sometimes coma or death. CO effects people by cutting off the supply or Oxygen to their muscles and brain. The harmful effects of CO exposure depend on both the concentration of CO in the air and the length of exposure.

Concentration of CO in Air	Inhalation Time and Toxic Symptoms Developed
50 ppm* (0.005%)	Maximum allowable concentration for continuous exposure in any 8-hour period.
200 ppm* (0.02%)	Slight headache, tiredness, dizziness, nausea after 2–3 hours.
400 ppm (0.04%)	Frontal headaches within 1–2 hours, life threatening after 3 hours.
800 ppm (0.08%)	Dizziness, nausea and convulsions within 45 minutes. Unconsciousness within 2 hours. Death within 2–3 hours.
1,600 ppm (0.16%)	Headache, dizziness and nausea within 20 minutes. Death within 1 hour.
3,200 ppm (0.32%)	Headache, dizziness and nausea within 5–10 minutes. Death within 30 minutes.
6,400 ppm (0.64%)	Headache, dizziness and nausea within 1–2 minutes. Death within 10–15 minutes.
12,800 ppm (1.28%)	Death within 1–3 minutes.

For additional information on CO and its dangers, ask your sales representative about Bacharach's Institute of Technical Training CO Seminars.

* *Maximum CO concentration for exposure at any time as prescribed by OSHA. Effects can vary significantly based on age, sex, weight, and overall state of health.*

Notes

Notes

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